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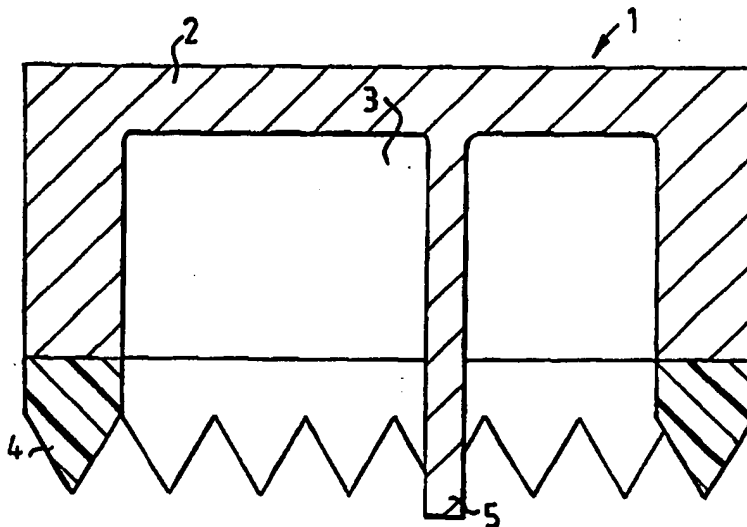
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(54) Title: A SHIELDING HOUSING, METHODS OF PRODUCING A SHIELDING HOUSING AND USE THEREOF

(57) Abstract

A shielding housing (1) cooperates with at least one conductor surrounding at least one component on a printed circuit board to electrically shield said at least one component. The shielding housing (1) comprises a shielding element (2) which carries a serrated, elastic shielding gasket (4), which is adapted to cooperate with said at least one conductor. The housing (1) is adapted to be pressed with its serrated gasket (4) against said conductor on the printed circuit board.



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A SHIELDING HOUSING, METHODS OF PRODUCING A SHIELDING HOUSING AND USE THEREOF**TECHNICAL FIELD**

- 5 The invention relates to a shielding housing for electrically shielding one or more components on a printed circuit board as well as to methods of producing such a shielding housing.

BACKGROUND OF THE INVENTION

- 10 To prevent components in electronic equipment, e.g. mobile phones, from transmitting unwanted high-frequency signals that may interfere with other electronic equipment or vice versa, i.e. to prevent other electronic equipment from interfering with components in mobile phones, such components have to be electrically shielded. Moreover, such a shielding is necessary in order for the
15 equipment to comply with electromagnetic compatibility (EMC) requirements.

- Today, soldered shielding cans or housings are used to shield critical components on a printed circuit board. The shielding cans are soldered to corresponding conductors on the printed circuit boards to cover and, thereby, shield the critical
20 components.

- However, it is often necessary to test the components located under the shielding cans. Such tests have to be carried out both during production stages and at after-sales services.

- 25 Shielding cans which are soldered to printed to printed circuit boards, are difficult and expensive to remove and replace in connection with such tests and services.

SUMMARY OF THE INVENTION

- 30 The object of the invention is to bring about an improved shielding housing which is easy and inexpensive to mount and dismount.

This is attained in that the shielding housing in accordance with the invention, comprises a shielding element which is provided with at least one serrated, elastic shielding gasket. The shielding gasket is adapted to make contact with at least one
5 corresponding conductor on a printed circuit board, surrounding a component or a set of components to be shielded, when the shielding housing is pressed against the printed circuit board.

Preferably, the serrated shielding gasket is deposited on the shielding element by
10 injection moulding.

The shielding housing according to the invention will be easy and inexpensive to mount and dismount in that it is not soldered to the printed circuit board but, instead, pressed to the printed circuit board. Thus, it will be cheaper to carry out a
15 test or service operation on a component which is shielded by such a shielding housing than if the component was shielded by a soldered shielding housing.

By making the shielding gasket serrated, the contact pressure which is necessary to obtain good electric contact between the shielding gasket and the corresponding
20 conductor on the printed circuit board, will not have to be as high as if the gasket was non-serrated. Moreover, less material is needed for a serrated gasket in comparison with a non-serrated gasket.

BRIEF DESCRIPTION OF THE DRAWING

25 The invention will be described more in detail below with reference to the appended drawing, on which Fig. 1 is a schematical cross-sectional view of a first embodiment of a shielding housing according to the invention, and Fig. 2 is a schematical cross-sectional view of a second embodiment of the shielding housing according to the invention.

PREFERRED EMBODIMENTS

In Fig. 1, a first embodiment of a shielding housing 1 according to the invention, is schematically illustrated in a cross-sectional view. To better illustrate the invention, the dimensions of the shielding housing 1 have been greatly exaggerated.

5

The shielding housing 1 shown in Fig. 1, comprises a shielding can 2. The shielding can 2 may be made either of a conducting material, such as aluminum, or of a plastic material with a conducting filler, such as graphite, or of a non-conducting material, such as a plastic material, covered by a conducting material, such as a conductive paint, a metallization, or a metal foil.

10

In the embodiment according to Fig. 1, the shielding can 2 has a single cavity 3 for receiving a component or components (not shown) to be shielded on a printed circuit board (not shown). However, it is to be understood that the shielding housing 1, of course, may have more than one cavity.

15

In accordance with the invention, the shielding can 2 is provided with a serrated, elastic shielding gasket 4 which is adapted to cooperate with a corresponding conductor (not shown) surrounding the component (not shown) to be shielded on a printed circuit board (not shown).

20

In case the shielding housing has more than one cavity, a shielding gasket would be provided for each cavity, if necessary.

25

The shielding gasket 4 is made of an electrically shielding material, e.g. a plastic material, such as silicone, silicone rubber, epoxy, polyurethane or a thermoplastic elastomer, having a conductive filler such as graphite or metal fibres, microspheres of silver or gold, or silver or gold plated microspheres.

30

The shielding gasket 4 in the embodiment according to Fig. 1, is deposited on the rim of the shielding can 2, preferably by injection moulding, but it may also be

deposited by gluing, dispensation or any other suitable process as long as good electric contact is obtained between the shielding can 2 and the shielding gasket 4.

In accordance with the invention, the shielding can 2, as illustrated in Fig. 1, is supposed to be pressed with its shielding gasket 4 against a conductor (not shown) on a printed circuit board (not shown) to shield one or more components thereon. In case of e.g. a mobile phone, the shielding can 2 may be pressed against a corresponding conductor on a printed circuit board by means of e.g. a covering lid on the mobile phone.

By making the shielding gasket 4 serrated in accordance with the invention, less contact pressure will be needed to obtain good electric contact between the shielding gasket 4 and the corresponding conductor (not shown) surrounding the components to be shielded on the printed circuit board (not shown), than if the shielding gasket was non-serrated. Moreover, by making the shielding gasket 4 serrated, the requirements on the accuracy of the dimensions of the gasket will be low.

In accordance with the invention, the shielding housing may be provided with a guiding element in order to locate the shielding housing on a printed circuit board.

In the embodiment in Fig. 1, the shielding can 2 is provided with a guiding pin 5 which is adapted to cooperate with a corresponding hole in a printed circuit board (not shown).

If necessary, the shielding housing may of course be provided with more than one guiding element. Also, it should be understood that the guiding elements do not necessarily have to cooperate with elements on a printed circuit board but may instead cooperate with other elements in a device, e.g. a mobile phone, comprising a printed circuit board having components to be shielded.

Fig. 2 shows a cross-sectional view of a second embodiment of a shielding housing according to the invention, generally denoted 6. It should be noted that, also in Fig. 2, the dimensions of the shielding housing are greatly exaggerated.

5 In the embodiment in Fig. 2, the shielding housing 6 comprises a flat plate 7 which carries a serrated, elastic shielding gasket 8 of the same nature as the shielding gasket 4 in Fig. 1. Thus, the shielding gasket 8 as such will not be described in more detail in this connection. However, in this embodiment, the shielding gasket 8 forms the rim of a cavity 9 for receiving a component or a set of components (not shown)
10 to be shielded on a printed circuit board (not shown). It is to be understood that also in this case, more than one shielding gasket may be needed on the plate in order to define more than one cavity, if necessary.

In the embodiment according to Fig. 2, the plate 7 is supposed to be made of a non-
15 conducting material. To make the plate 7 shielding, a shielding layer 10 of the same conducting material as the gasket 8 has been deposited, integral with the gasket 8, on the plate 7, preferably in the same injection moulding process as the gasket 8.

It should, however, be understood that the plate 7 equally well may be of a
20 conducting material. In such a case, just the shielding gasket 8 and not the conducting layer 10 would, of course, be deposited on the plate 7.

To locate the shielding housing 6 in Fig. 2 on a printed circuit board (not shown), the shielding housing 6 is, in this embodiment, provided with a hole 11 through
25 which a screw (not shown) may be screwed into a corresponding hole on the printed circuit board (not shown) to fix the housing to the printed circuit board. As an alternative, the hole 11 may instead cooperate with a guiding pin (not shown) provided on a printed circuit board (not shown).

30 In accordance with the invention, the shielding housing may also be pressed to a printed circuit board by means of clips.

- 5 As should be apparent from the above, the shielding housing according to the invention will be easy and inexpensive to mount and dismount. By means of the serrated, elastic shielding gasket, good electric contact will be obtained between the shielding housing and a corresponding conductor on a printed circuit board when the shielding housing is pressed with its gasket against a corresponding conductor on a printed circuit board.

CLAIMS

1. A shielding housing (1; 6) which is adapted to cooperate with at least one conductor surrounding at least one component on a printed circuit board to electrically shield said at least one component on the printed circuit board, characterized in that the housing (1; 6) comprises a shielding element (2; 7) which carries at least one serrated, elastic shielding gasket (4; 8), which is adapted to cooperate with said at least one conductor on the printed circuit board, the housing (1; 6) being adapted to be pressed with said at least one serrated gasket (4; 8) against said at least one conductor on the printed circuit board.
2. The housing as claimed in claim 1, characterized in that the shielding element (7) is a plate, and that said at least one serrated, elastic shielding gasket (8) forms the rim of at least one cavity (9) on the plate (7) for receiving said at least one component on the printed circuit board.
3. The housing as claimed in claim 2, characterized in that the plate (7) is of a non-shielding material, and that the plate (7) is provided with a layer (10) of a shielding material, integral with said at least one serrated, elastic shielding gasket (8).
4. The housing as claimed in claim 1, characterized in that the shielding element (2) exhibits at least one cavity (3), and that said at least one serrated, elastic shielding gasket (4) is provided on the rim of said at least one cavity (3) for receiving said at least one component on the printed circuit board.
5. The housing as claimed in any of claims 1 - 4, characterized in that it is provided with at least one guiding element (5; 11) for locating the housing (1; 6) on the printed circuit board.
6. The housing as claimed in claim 5, characterized in that the guiding element comprises at least one guiding pin (5) which is adapted to be inserted into a

corresponding hole in the printed circuit board to locate the housing (1) thereon.

5 7. The housing as claimed in claims 5 or 6, characterized in that the guiding element comprises at least one hole (11) which is adapted to cooperate with a locating element for locating the housing (6) on the printed circuit board.

10 8. The housing as claimed in claim 7, characterized in that the locating element is a screw which is adapted to cooperated with a corresponding hole in the printed circuit board.

9. The housing as claimed in claim 7, characterized in that the locating element is a pin provided on the printed circuit board.

15 10. The housing as claimed in any of claims 1 - 9, characterized in that said at least one serrated, elastic shielding gasket (4; 8) has been deposited on the shielding element (1; 6) by injection moulding.

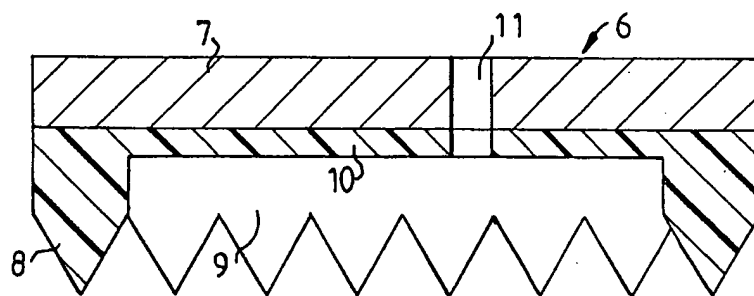
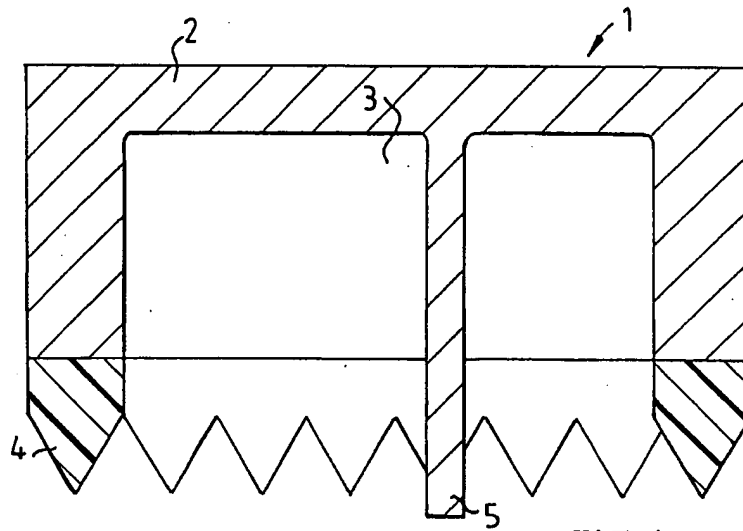
20 11. A method of producing a shielding housing for electrically shielding at least one component on a printed circuit board, said at least one component being surrounded by at least one conductor on the printed circuit board, characterized by depositing, on a shielding element (2; 7), at least one serrated, elastic shielding gasket (4; 8), the housing (1; 6) being adapted to be pressed with said at least one serrated gasket (4; 8) against said at least one conductor on the printed circuit board.

25 12. A method of producing a shielding housing for electrically shielding at least one component on a printed circuit board, said at least one component being surrounded by at least one conductor on the printed circuit board, characterized by depositing, on a non-shielding element (7), at least one serrated, elastic shielding gasket (8) of a shielding material, and, integral with the gasket, a shielding layer (10) of the same
30 shielding material as the gasket (8), the housing (6) being adapted to be pressed with

said at least one serrated gasket (8) against said conductor on the printed circuit board.

- 5 13. A mobile phone comprising, on a printed circuit board, at least one component electrically shielded by a shielding housing cooperating with at least one conductor surrounding said at least one component on the printed circuit board, characterized
10 in that the housing comprises a shielding element which carries at least one serrated, elastic shielding gasket which is adapted to cooperate with said at least one conductor, the housing being pressed with said at least one serrated gasket against said at least one conductor on the printed circuit board.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/00986

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H05K 9/00, G12B 17/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H05K, G12B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2778868 A (W.E. STINGER), 22 January 1957 (22.01.57), column 1, line 70 - line 72, figures 3a-3b, claims 1-2 --	1,11-12
X	US 5039825 A (V.M. SAMAROV), 13 August 1991 (13.08.91), figures 1-3, claims 1-12, abstract --	1,11-12
A	US 5150282 A (M. TOMURA ET AL.), 22 Sept 1992 (22.09.92), figure 4 --	1,5-7,11-13
A	US 5045635 A (J.J. KAPLO ET AL.), 3 Sept 1991 (03.09.91), figure 1, abstract --	1,11-12

☒ Further documents are listed in the continuation of Box C.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5008485 A (H. KITAGAWA), 16 April 1991 (16.04.91), figures 1-2, abstract --	1,11-12
A	US 5578790 A (W.A. PEREGRIM), 26 November 1996 (26.11.96), figures 1-6, abstract -- -----	1,11-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

27/07/98

International application No.

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Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	2778868	A	22/01/57	NONE	
US	5039825	A	13/08/91	NONE	
US	5150282	A	22/09/92	NONE	
US	5045635	A	03/09/91	AU 622847 B	16/04/92
				AU 5602890 A	20/12/90
				CA 1319967 A	06/07/93
				DE 69024707 D,T	23/05/96
				DK 147490 A	17/12/90
				EP 0403112 A,B	19/12/90
				FI 902606 D	00/00/00
				JP 3028578 A	06/02/91
				KR 9612119 B	12/09/96
US	5008485	A	16/04/91	DE 3934845 A	03/05/90
				DE 8912397 U	07/12/89
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				JP 2051959 C	10/05/96
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				JP 7087275 B	20/09/95
US	5578790	A	26/11/96	NONE	